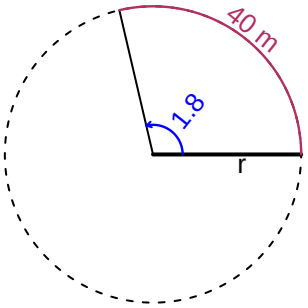
Name: Date:

Trig Final (Solution v23)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 40 meters. The angle measure is 1.8 radians. How long is the radius in meters?

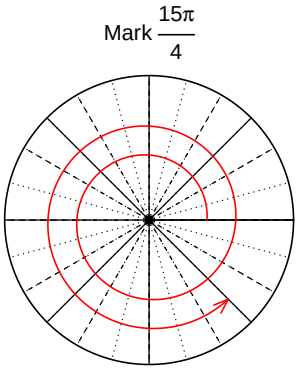


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

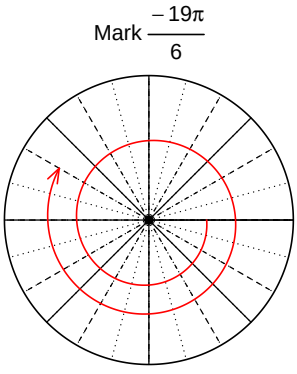
$r = 22.22$ meters.

Question 2

Consider angles $\frac{15\pi}{4}$ and $\frac{-19\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{15\pi}{4}\right)$ and $\cos\left(\frac{-19\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\sin(15\pi/4)$



Find $\cos(-19\pi/6)$

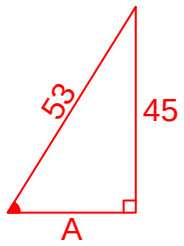
$\sin(15\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(-19\pi/6) = \frac{-\sqrt{3}}{2}$

Question 3

If $\sin(\theta) = \frac{45}{53}$, and θ is in quadrant II, determine an exact value for $\cos(\theta)$.

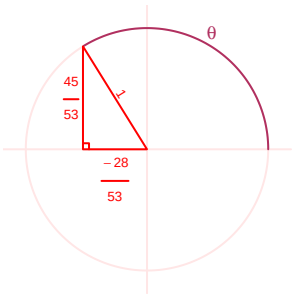
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 45^2 = 53^2$$
$$A = \sqrt{53^2 - 45^2}$$
$$A = 28$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\cos(\theta) = \frac{-28}{53}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 3.03 meters, a frequency of 7.61 Hz, and a midline at $y = 4.7$ meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.03\cos(2\pi 7.61t) + 4.7$$

or

$$y = -3.03\cos(15.22\pi t) + 4.7$$

or

$$y = -3.03\cos(47.82t) + 4.7$$